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Research Article

Macrofungi of Mata da Margaraça (Portugal), a relic from the Tertiary Age

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Abstract

Mata Nacional da Margaraça represents a rare example where the Atlantic climate influences the perpetuity of a small enclave of a previously widespread laurel forest. The higher relative humidity values (> 80%), which are almost constant all year long and the mild temperatures, rarely exceeding 30°C, even in the dry season (June to September), create an insular-like effect. The biological communities of Margaraça exhibit a transitory character. The forest is dominated by *Quercus robur* and *Castanea sativa*, yet *Quercus suber*, although less frequent, can also be found. The laurel species, such as *Viburnum tinus*, *Ilex aquifolium*, *Laurus nobilis* and the Portuguese endemic *Prunus lusitanica* ssp. *lusitanica*, relics from the ancient Portuguese Tertiary, comprise the understorey. The present work represents, to the best of our knowledge, the first regional macrofungal species list of the Mata da Margaraça published to date. The recent fires that occurred in the area have provided the opportunity to study the post-fire communities. The surveys were carried out in 2004 and later in 2018-2019. A total of 271 species were registered as belonging to Basidiomycota (≈ 80%) and Ascomycota (≈ 20%). The most represented Basidiomycota families were Russulaceae, Mycenaceae and Agaricaceae and the most represented Ascomycota families were Pyronemataceae and Pezizaceae. The new records to Portugal add up to a total of 88 species and another 116 species are new records to the province of Beira Litoral. Post-fire fungi account for 17 of the total of 271 species registered in these studies and most of these species are new to Portugal.

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Keywords

Ascomycota, Basidiomycota, Beira Litoral, Portugal, Laurisilva, post-fire

Introduction

Continental Portugal's unique location – eastern border of the Atlantic Ocean – allows for the co-existence of two biogeographic regions (the Eurosiberian region and the Mediterranean region) with distinct bioclimatic features (Costa et al. 1998). Besides the predominant Mediterranean climatic influence in the country, there are, nevertheless, rare locations where the Atlantic influence supports the establishment and continuity of different plant communities, some of which are relics of ancient forests, dating back to the Miocene and Pliocene periods. In that context, the Mata Nacional da Margaraça (M.M.) represents a rare example where the Atlantic climate influences the perpetuity of a small enclave of a previously widespread laurel forest called Laurisilva within the landscape of the Serra do Açor, which largely has a Mediterranean climate. Hence, in 1982, the Serra do Açor became a protected landscape area (A.P.P.S.A.) to protect the M.M. Nowadays, the M.M. is included in the European Network of Biogenetic Reserves and is a Site of Community Importance (SCI) under the Nature 2000 network (PTCON00051). With a total area of 68 ha, the M.M. is a unique reserve of biodiversity and an important conservation site in Central Portugal.

M.M. is situated in the Iberian fold belt (Lourenço 1996), between two large faults and several small ones and it is mainly occupied by acidic soils, originating from granite and schist rocks. The M.M. is located between 450 and 800 m above sea level and has an N-NW orientation. These topographic, geomorphologic and geographic characteristics are unique compared to other mountain regions with Atlantic climate influence in North and Central Portugal. For instance, the higher relative humidity values (> 80%), which are almost constant all year long and the mild temperatures, rarely exceeding 30°C, even in the dry season (June to September), create an insular-like effect, that is translated into the isolation of the ecosystems and species of the M.M. from the surrounding areas of the Serra do Açor (Neves 2005).

The biological communities of M.M. exhibit a transitory character, with a diverse flora comprised of Atlantic, Eurosiberian and Mediterranean species. However, given its dominance, the *Rusco aculeati-Quercetum roboris* association, sub-association *Viburnetosum tini*, class *Querco-Fagetea*, order *Quercetalia roboris* and alliance *Quercion robori-pyrenaicae*, best describe the flora of the M.M. (Alves et al. 1998). As such, in its majority, the forest is dominated by the Atlantic and Eurosiberian arboreal species. *Quercus robur* L. and *Castanea sativa* Mill. occupy most of the inner part of M.M., yet *Quercus suber* L., although less frequent, can be found on the outskirts of the M.M. The understorey is comprised mainly of laurel species (e.g. *Viburnum tinus* L., *Ilex aquifolium* L., *Laurus nobilis* L. and the Portuguese endemic *Prunus lusitanica* L. ssp. *lusitanica*) which are relics from the ancient Portuguese Tertiary Laurisilva forests (Habitats Directive

Annex B-I, 5230). Furthermore, *Prunus lusitanica* ssp. *lusitanica*, contained in the Red List of Vascular Flora of Portugal, has, in the M.M., the largest number of individuals within its distribution range. Other shrub species, such as *Cytisus* spp., *Erica* spp., *Calluna vulgaris* (L.) Hull, *Ulmus minor* Mill., *Prunus cerasus* L., *Prunus avium* L., *Corylus avellana* L. and *Arbutus unedo* L., are also present in the understorey of these woods. In M.M., some of them can reach far greater sizes than in the rest of their distribution range. The M.M. herbaceous stratum accounts for many of the endemic species and the majority is listed in the Habitats Directive (H.D.) for this SCI, such as *Eryngium duriaei* Gay ex Boiss, *Lavandula stoechas* L. ssp. *luisieri* (Rozeira) Rozeira, *Antirrhinum meonanthum* Hoffmans. & Link, *Veronica micrantha* Hoffmans. & Link (in H.D. Annex II) and *Murbeckiella sousae* Rothm. (in H.D. Annex IV). The Bryoflora on the site is particularly well represented, with more than 150 species described. Some of these species, like *Cephaloziella elegans* (Heeg) Schiffn., *Campylopus pyriformis* Brid., *Hypnum revolutum* (Mitt.) Lindb., *Plagiothecium nemorale* (Mitt.) A. Jaeger and *Plagiothecium succulentum* (Wilson) Lindb., are restricted to M.M. in the Portuguese territory. Moreover, the reduced distribution of the above-mentioned *Plagiothecium* species in the national territory highlights the importance of M.M. as a preclimatic forest system.

Until the 1960s, the A.P.P.S.A. suffered profound human-induced landscape changes: 1) Massive deforestation was undertaken in order to create pastures, agricultural lands and for edification; 2) Replacement of the main forest with *Pinus pinaster* Ainton. monocultures. However, the M.M. area was preserved in order to produce wood (*Castanea sativa* coppice stands) and to harvest the forest surplus production. Later, rural desertification led to a decrease in agricultural land and pastures, which greatly contributed to shrub encroachment and forest regeneration (Moreira et al. 2011), by favouring the ecological succession and promoting the natural values of A.P.P.S.A. and particularly of M.M. However, the cumulative organic matter deposited on the forest floor increased the risk of high-intensity fires (Pausas et al. 2008) and culminated in the forest fires of 1987 and 2017 which burned 90% of the M.M. area and threatened its biodiversity, particularly in the upper limit of the M.M. and in its outskirts where non-native species (*Pinus* spp. and *Acacia* spp.) are more frequent. The fire had almost no effect in the lower limit of M.M. where the main forest remained untouched and the M.M. recover capability was preserved.

To the best of our knowledge, the present work represents the first regional macrofungal species list of M.M. published so far and one of the few available for Portugal (e.g. Louro et al. 2009). Due to its singularity, M.M. is a remarkable location for examining and documenting the macrofungal communities, as a unique relic of the ancient forests that previously occupied most of the national territory. Additionally, the recent fires that occurred in the area have provided the opportunity to observe the post-fire communities which, before the fire (undisturbed period), were less likely to be detected. The addition of these species to the list is particularly important since little is known about post-fire macrofungi communities in Laurel forests.